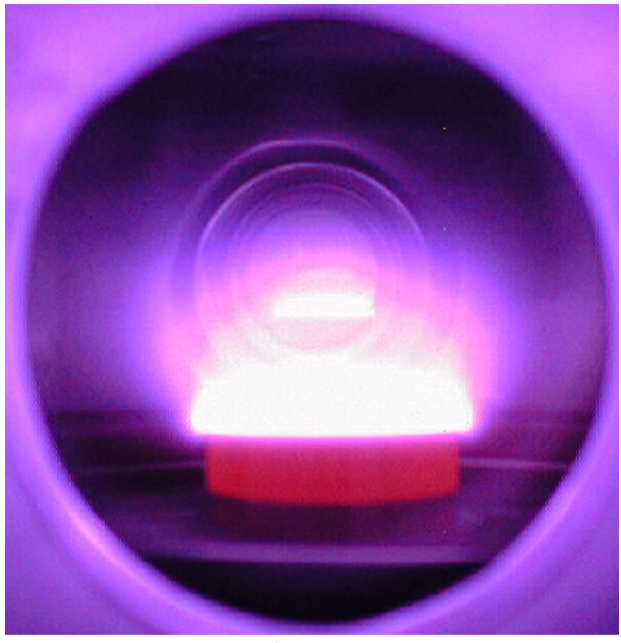
Diamond Growth and Fabrication



Diamond Growth in Progress

Why? Superlative Properties!

Diamond Is:

- **THE BEST THERMAL CONDUCTOR**
  (Three times better than copper) SEE DEMO!
  Use in high performance electronics
- **A WIDE-BAND GAP SEMICONDUCTOR**
  Use in high voltage/power devices (All-Electric-Ship) and high temperature devices (resistant to harsh environment and radiation damage)
- **OPTICALLY TRANSPARENT**
  Use in Missile sensors and guidance windows
- **HIGHLY STIFF AND CORROSION RESISTANT**
  Use as accelerometers and in harsh environment
- **CHEMICALLY STABLE**
  (Diamond survives boiling acids and bases, is bio-compatible and has novel electrochemistry)

The Naval Research Laboratory (NRL) grows poly and single crystalline diamond materials by chemical vapor deposition. High quality, intrinsic diamond (better than nature) can be grown, or the material can be intentionally doped with impurities while it is grown, allowing a wide range of electrical, optical, and mechanical properties to be fabricated. Subsequent laser cutting, polishing, reactive ion etching, layer liftoff, and metallization are employed for device fabrication. Polycrystalline diamond materials can be fabricated at NRL as large as freestanding plates up to 50 mm diameter and several mm thick, or as thin films up to 75 mm diameter and thickness ranging form 0.1 to 50 microns on various substrate materials. Conformal thin films coating of diamond have been deposited at low temperatures and replicas of substrate topology have been made by etching the substrate material away.

Test the thermal conductivity of Diamond against Copper, Aluminum and Glass. Press your finger against each of the four buttons and notice the speed at which your finger feels the cold. Which one registers cold fastest?

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